CHALLENGES IN EVALUATING RELATIONSHIPS BETWEEN QUANTITATIVE DATA (CARBON DIOXIDE) AND QUALITATIVE DATA (SELF-REPORTED VISUAL CHANGES)

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BACKGROUND

Understanding the nuances in clinical data is critical in developing a successful data analysis plan. Carbon dioxide (CO_2) data are collected on board the International Space Station (ISS) in a continuous stream. Clinical data on ISS are primarily collected via conversations between individual crewmembers and NASA Flight Surgeons during weekly Private Medical Conferences (PMC). Law, et.al, 2014[1] demonstrated a statistically significant association between weekly average CO_2 levels on ISS and self-reported headaches over the reporting period from March 14, 2001 to May 31, 2012. The purpose of this analysis is to describe the evaluation of a possible association between visual changes and CO_2 levels on ISS and to discuss challenges in developing an appropriate analysis plan.

METHODS & PRELIMINARY RESULTS

A first analysis was conducted following the same study design as the published work on CO_2 and self-reported headaches[1]; substituting self-reported changes in visual acuity in place of self-reported headaches. The analysis demonstrated no statistically significant association between visual impairment characterized by vision symptoms self-reported during PMCs and ISS average CO_2 levels over ISS missions. Closer review of the PMC records showed that vision outcomes are not well-documented in terms of clinical severity, timing of onset, or timing of resolution, perhaps due to the incipient nature of vision changes. Vision has been monitored in ISS crewmembers, pre- and post-flight, using standard optometry evaluations. In-flight visual assessments were limited early in the ISS program, primarily consisting of self-perceived changes reported by crewmembers. Recently, on-orbit capabilities have greatly improved. Vision data ranges from self-reported post-flight changes in visual acuity, pre- to post-flight changes identified during fundoscopic examination, and in-flight progression measured by advanced on-orbit clinical imaging capabilities at predetermined testing intervals. In contrast, CO_2 data are recorded in a continuous stream over time; however, for the initial analysis this data was categorized into weekly averages.

FORWARD WORK

Several analyses are planned to investigate the relationship between CO_2 and different outcomes of interest. We will discuss possible ways CO_2 exposure can be characterized based on various types of outcomes, collected using qualitative and quantitative methods.

REFRENCES

[1] Law *et.al,* (2014) *Journal of Occupational and Environmental Medicine 56(5):477-483.*